THE FORMICIDAE OF THE HARRISON WILLIAMS GALAPAGOS EXPEDITION.

By William Morton Wheeler.

(Figures 19–27 incl.).

Four years ago I published an account of the Galapagos ants collected by the Expedition of the California Academy of Sciences in 1905 and 1906 and of those previously taken on some of the voyages of the "Albatross."[1] The fact that the description of these materials revealed almost nothing in regard to the habits of the insects and the prospect of finding additional species led me to accept the very generous invitation of Mr. Harrison Williams and Mr. William Beebe to join their expedition to the archipelago. Although the region that could be covered in the time at our disposal was limited, we were able to secure nineteen different forms, eight of which (two species and six varieties) are new to science and one (*Monomorium floricola*) a well-known tropicopolitan ant not hitherto recorded from the islands. The collection of so small a number of forms in any spot on the American mainland, except its arctic and antarctic ends, would have very little or no significance, but considering the meagerness of the Galapagos ant-fauna and the time and effort required in securing even a small number of specimens, those obtained and the observations made on their habits are well worth recording. Many other groups of insects, such as the butterflies, bees, wasps, termites, many families of Diptera, Coleoptera, etc., are even less abundantly represented in the Galapagos fauna. To the general statements on the Formicidae in the introduction to my paper of 1919 I have nothing to add.

Family FORMICIDAE.

Subfamily Ponerinae.

Cylindromyrmex williamsi sp. nov.

(Fig. 19, *b* and *c*).

Worker. Length 4.5–6 mm.

Closely related to *C. striatus* Mayr. Head longer than in that species, oblong, about one and a fourth times as long as broad, with nearly straight, parallel sides and feebly excavated posterior border. Eyes rather large, but

[1] The Ants of the Galapagos Islands, Proc. Calif. Acad. Sci. (4) 2, 1919, pp. 259–310.

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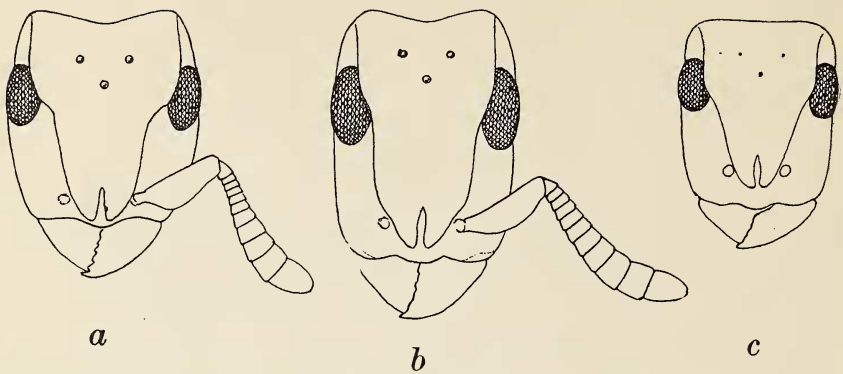

FIG. 19. CYLINDROMYRMEX STRIATUS MAYR; *C. WILLIAMSI* sp. nov. *a*, head of female *C. striatus*; *b*, head of female and *c*, head of worker *C. williamsi*.

not very convex, their anterior orbits at the median transverse diameter of the head. Small workers with distinct ocellar pits, large workers with a small anterior ocellus. Mandibles rather flat, with nearly straight external borders, the apical tooth large and blunt, the apical border somewhat undulating but not distinctly denticulate. Clypeus short, depressed, flat in the middle, more convex on the sides, which are produced and rounded anteriorly while the median border, though broadly rounded, recedes. Frontal area elongate elliptical, deeply impressed. Frontal carinae moderately prominent, extending back to the posterior orbits and thence continuous with rugae to the posterior corners of the head as in *striatus*. Antennal scapes reaching to the eyes, about four times as long as broad; funicular joints 2–6 much broader than long, 7–8 also transverse but proportionally longer, terminal joint about one and one-half times as long as broad. Thorax as in *striatus* but somewhat longer and more rectangular, about twice as long as broad; epinotal declivity sharply marginate laterally and above. Petiole in the smallest worker as broad as long, in larger individuals distinctly longer than broad; its anterior surface marginate on the sides and above, its anteroventral surface with a large, blunt, compressed tooth. Postpetiole from above trapezoidal, one and one-third times as long as its anterior border, the sides much less convex than in *striatus*. First gastric segment about one-fourth broader than the postpetiole; pygidium subtruncate, with a row of acute denticles on each side of its posterior half. Legs very distinctly more slender than in *striatus*, the anterior tibia fully three times as long as broad (in *striatus* scarcely two and one-half times). Middle and hind tibiae each with a single pectinated spur.

Shining; mandibles subopaque, sharply longitudinally striate. Middle of clypeus smooth, its sides, the scapes and the large antennal foveae finely longitudinally striate; cheeks and gular surface of head coarsely and somewhat irregularly, longitudinally striate; head above, thorax, petiole and postpetiole sculptured much as in *striatus*, with coarse longitudinal striae separated by rounded rugae, those on the thorax, petiole and postpetiole very regular, on the

head somewhat divergent posteriorly and dividing, thus increasing their number at the occipital border. There are also some coarse interrugal punctures in this region. The number of rugae on the vertex between the posterior continuations of the frontal carinae is about 15, there are about 10 on the thoracic dorsum and petiole and about twice that number on the postpetiole. Epinotal declivity and anterior surface of petiole shining and very finely shagreened. Gaster and legs very smooth and shining, with minute, scattered, piligerous punctures.

Hairs whitish, very sparse, conspicuous only on the clypeus, tip of gaster and venter; gaster with sparse, rather long pubescence; hairs on the tibiae very sparse, subappressed.

Black; tip of last funicular joint and terminal tarsal joints testaceous.

Female (dealated). Length nearly 7 mm.

Differing from the worker in having the head fully one and one-half times as long as broad. The eyes are larger and there are three rather small ocelli. Thorax somewhat depressed above, the pronotum with concave sides, broader behind than in front and broader than long, its lateral borders straight. Mesonotum and scutellum small, the former as broad as long, arcuately rounded in front. Epinotum with subequal base and declivity, the former of nearly the same shape and size as the pronotum. Sculpture and color similar to that of the worker but the striae on the sides of the thorax are finer. Hairs on the femora and tibiae much more numerous.

This species, which I dedicate to Mr. Harrison Williams, is described from two workers and a female taken near the south end of South Seymour Island, April 20th, 1923. In my paper of 1919 I erroneously identified this ant from specimens taken by Dr. F. X. Williams at Academy Bay, Indefatigable Island, as Mayr's *C. striatus*. On comparing one of the workers collected by Dr. Williams and the three specimens described above with a female of the true *striatus* (fig. 19 *a*) taken by Prof. C. T. Brues at Guayaquill, Ecuador and Cameron's figure of the worker, which he erroneously described as *Holcoponera whymperi*, I find that the Galapagos species is quite distinct. The legs of *striatus* are shorter, much more robust and of a different color, the head is shorter, the eyes smaller and less convex and the median portion of the clypeus longer and more produced, the antennal scapes are broader, the rugae on the head, thoracic dorsum, petiole and postpetiole are somewhat stronger and more even, the pubescence on the gaster is shorter and the hairs on the legs much less numerous. The striae on the mandibles, on the contrary, are more superficial and the mandibles, clypeus, cheeks and antennae are dark red.

The three specimens which I took on South Seymour Island, together with several young larvae, formed the entire personnel of a colony which was nesting in the dead branch of a Celastraceous shrub (*Maytenus obovata* Hook. *fil.*) growing near the beach. Many of the dead branches of the same shrub contained flourishing colonies of *Calotermes pacificus* Banks, but the ants did not actually live among them though evidently occupying galleries which they had once inhabited. This fact is of interest, because colonies of the allied genus Simopone of the Ethiopian and Malagasy regions have been taken in dead branches. Arnold records *S. marleyi* Arnold as occurring in hollow stems of the castor oil plant at Durban, Natal. That the ants of the two genera, Simopone of the Old, and Cylindromyrmex of the New World, which together

constitute Emery's Ponerine tribe Cylindromyrmicini, prey on termites and tend to establish their colonies near these insects is also indicated by Mayr's statement that Hetschko found *C. brasiliensis* in wood in the galleries of a termite at Santa Catharina, Brazil.

The larvae of *C. williamsi*, to which I have referred, were unfortunately lost through breaking of the vial in which they were contained so that I am unable to figure them. They were very long and slender, with narrow, curved neck and small head. The body was smooth, i. e., nontuberculate and covered with numerous, short, even hairs, as in Stigmatomma and allied Ponerine genera.

Among the specimens in my collection I find a winged female of a peculiar Bolivian Cylindromyrmex, of which I insert a description:

Cylindromyrmex (Metacylindromyrmex) boliviae sp. nov.

(Fig. 20).

Female. Length 10 mm.

Closely related to *C. godmani* Forel. Head subrectangular, fully one and one-half times as long as broad, as broad in front as behind but somewhat narrowed in the middle; its posterior border rather deeply and subangularly excised. Eyes moderately convex, but not as large as in the preceding species, their anterior orbits at the median transverse diameter of the head. Mandibles large, convex, with rounded external borders, a blunt apical tooth and broad, toothless apical border. Clypeus very short, abrupt in the middle, overarched by the very large and projecting frontal carinae, which extend back to the middle of the eyes. Frontal area elongate-elliptical, deeply impressed. Antennal scapes about two and one-half times as long as broad, abruptly narrowed at the base, with straight posterior and convex anterior border as in the preceding species; funicular joints 2–6 extremely short and transverse, the two penultimate joints nearly as long as broad. Thorax depressed above; pronotum transversely suboblong, only slightly broader behind than in front, its sides concave, its lateral borders subparallel and marginate; mesonotum as broad as long, its anterior border semicircular, its lateral borders concave; base of epinotum longer than the abrupt declivity which is concave in the middle and submarginate on the sides and above. Petiole subcylindrical, about one and one-fourth times as long as broad, concave on the sides, its anterior surface submarginate on the sides and above, its anteroventral surface with a large, blunt, compressed tooth. Postpetiole as long as broad, somewhat broader behind than in front, with straight sides, anterior and posterior borders, its ventral portion very convex and projecting in front. Pygidium slightly truncated behind, armed with a row of acute denticles on each side of its posterior half. Legs stout as in *C. striatus*, the fore tibiae somewhat less than two and one-half times as long as broad. Median and hind tibiae each with two well-developed pectinated spurs.

Shining; mandibles with fine, interrupted, superficial striae; anterior half of gula with coarse longitudinal striae, posterior half coarsely and sparsely punctate. Cheeks with a long, pronounced longitudinal stria or groove. Antennal foveae rather coarsely striate, remainder of head with longitudinal striae separated by rugae which on the front and occiput become coarser, more regular and very slightly divergent. Scapes very finely striolate. Pronotum with about

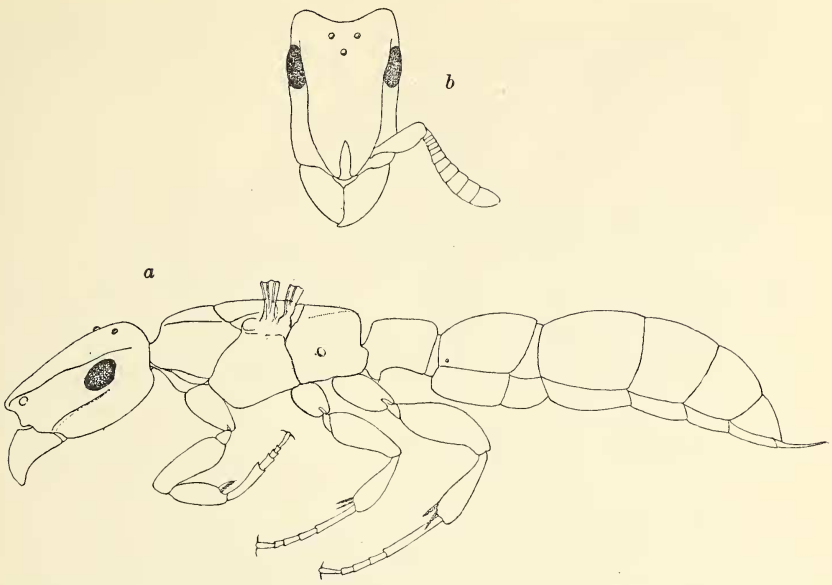

FIG. 20. *CYLINDROMYRMEX (METACYLINDROMYRMEX) BOLIVIAE* sp. nov. Female: *a*, profile, wings removed; *b*, head.

20 strong longitudinal rugae, separated by deep striae, mesonotum smooth behind, longitudinally striate in front, the striae diverging posteriorly. Scutellum smooth and shining, with a few punctures near its posterior border. Epinotum and petiole longitudinally striate, the striae rather irregular or branching. Sides of epinotum and lower mesosterna rather finely and sharply striate, upper mesosterna and sides of pronotum very smooth and shining. Postpetiole like the gaster, very smooth and shining, with small, scattered, piligerous punctures.

Hairs yellow, short, erect or suberect, more numerous than in *williamsi* on the head, thorax and petiole, on the gaster less numerous, longer and more erect. Tibiae and tarsi with long, uneven, suberect, somewhat bristly hairs.

Black; mandibles, funiculi, tips and bases of scapes, coxae and tip of gaster deep castaneous red; legs brownish yellow, knees and tips of tibiae darker. Wings distinctly infuscated, with dark brown veins and pterostigma.

A single specimen from Mapiri, Bolivia (Staudinger).

This species is very closely related to *C. godmani* of Panama and Ecuador, also known only from female specimens, but the latter species is larger (12.5 mm.), its antennal scapes and tibiae are shorter (scarcely twice as long as broad), the apical borders of the mandibles are bluntly denticulate, the petiole is shorter and has traces of striae, the femora are darker and the wings are described as brownish violaceous as in the bee *Xylocopa violacea*.

The workers and females of the seven known species of Cylindromyrmex may be separated by means of the following table:

1. Workers . . . . . 2.
   Females . . . . . 6.
2. Eyes very small and flat; anterior border of petiole emarginate in middle; first gastric segment striate . . . . . 3.
   Eyes large and convex, anterior border of petiole entire; first gastric segment smooth and shining . . . . . 4.
3. Head nearly twice as long as broad; apical borders of mandibles edendulate. Length 8 mm. (Brazil) . . . . . *longiceps* Ern. André.
   Head one and one-half times as long as broad; apical borders of mandibles bluntly denticulate. Length 5.5–6.5 mm. (Venezuela) . . . . . *meinerti* Forel.
4. Striae of head, thorax and pedicel coarse and regular; coxae trochanters and femora black or dark brown . . . . . 5.
   Striae of head, thorax and pedicel finer and less regular; legs yellow throughout. Length 6–7.3 mm. (Brazil, Paraguay) *brasiliensis* Emery.
5. Legs slender, entirely black, except the terminal tarsal joints. Length 4.5–6 mm. (Galapagos Islands) . . *williamsi* sp. nov.
   Legs stouter, tibiae except their ends, pale ivory yellow (Surinam, Peru, Ecuador) . . . . . *striatus* Mayr.
6. Frontal carinae moderately large; head not narrowed at the median transverse diameter; postpetiole coarsely longitudinally striate; middle and hind tibiae each with a single well-developed pectinated spur . . . . . 7.
   Frontal carinae larger and more projecting; head appreciably narrowed at the median transverse diameter; middle and hind tibiae each with two well-developed pectinated spurs . . 8.
7. Head one and one-half times as long as broad; legs black, except the terminal tarsal joints. Legs slender. Length 7 mm. . . . . *williamsi* sp. nov.
   Head shorter; legs stouter; tibiae, except their tips, pale ivory yellow. Length 7 mm. . . . . *striatus* Mayr.
8. Postpetiole nonstriate; fore tibiae more than twice as long as broad; femora yellow; wings brownish. Length 10 mm. (Bolivia) . . . . . *boliviae* sp. nov.
   Postpetiole somewhat striate; tibiae scarcely twice as long as broad; femora reddish black; wings brownish violaceous. Length 12.5 mm. (Panama, Ecuador) . . . . . *godmani* Forel.

The foregoing table shows that the species of Cylindromyrmex may be arranged in three distinct groups or subgenera, namely, *longiceps* and *meinerti*, which have very small, flat eyes in the worker and for which I suggest the name **Hypocylindromyrmex** subgen. nov., with *longiceps* as the type; *striatus*, *brasiliensis* and *williamsi*, which have large, rather convex eyes, moderate frontal carinae and only a single well-developed pectinated spur on the posterior tibiae (*Cylindromyrmex* sens. str., with *striatus* as the type), and *godmani* and *boliviae* with large, rather convex eyes, very large frontal carinae and two well-developed pectinated spurs on the posterior tibiae (**Metacylindromyrmex** subgen. nov., with *godmani* as the type). The brownish color and minute eyes of the

two species of Hypocylindromyrmex indicate that they do not inhabit twigs like the species of the two other subgenera but that they lead a hypogaeic life, probably in the abandoned galleries of terrestrial termites.

Ponera beebei sp. nov.

(Fig. 21).

Female (deälated). Length nearly 2 mm.

Head subrectangular, about one-sixth longer than broad, with distinctly concave posterior border, the sides behind the eyes straight and parallel, contracted somewhat in front of the eyes, which are small, rather flat and scarcely longer than their distance from the anterior corners of the clypeus. Ocelli small and widely separated. Mandibles moderately large, their broad apical

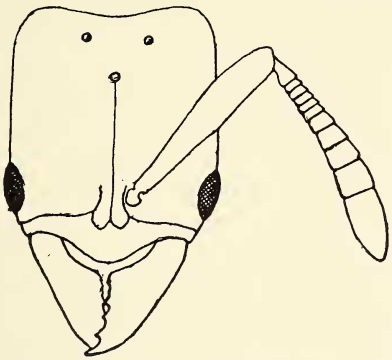

FIG. 21. *PONERA BEEBEI* sp. nov.
Head of female.

borders with four rather widely separated, acute teeth. Clypeus short, abrupt, strongly carinate, its anterior border advanced and rounded in the middle, sinuate on each side. Frontal carinae rounded, with ciliated borders; frontal groove distinct, extending to the anterior ocellus. Antennal scapes not reaching the posterior border of the head; funicular joints 2–6 subequal, very transverse, more than twice as broad as long; remaining joints forming a 5-jointed club, all the joints of which, except the last, are broader than long and gradually increase in length apically, the terminal joint somewhat shorter than the three preceding joints together. Thorax slightly more than twice as long as broad, as broad behind as in front, rounded anteriorly and posteriorly, its dorsal outline straight in profile, the mesonotum and scutellum small and flat, the former broader than long, with semicircular anterior border; epinotum with straight base and declivity, the latter longer than the former, its sides rounded, not marginate. Petiolar node thick, about one and one-half times as high as long, much narrower than the epinotum, truncated anteriorly and posteriorly and with a rounded summit, which is distinctly thinner than the base. Seen from behind the node is subcircular. The ventral surface in profile is feebly convex, not swollen, and without an anterior tooth. Postpetiole trapezoidal from above, broader than long, narrowed in front, with straight anterior and

lateral borders; strongly truncated in front. Constriction behind the postpetiole well-developed. First gastric segment distinctly broader than long, from above transversely rectangular. Legs rather slender.

Shining; mandibles smooth, with minute scattered piligerous punctures; remainder of body finely and distinctly but not very densely nor deeply punctulate; sides of thorax finely rugulose; antennal scapes and legs more finely and densely punctulate and less shining.

Hairs and pubescence white, abundant, the former short and uneven, most distinct on the clypeus, summit of petiole and tip of gaster, the pubescence long, subappressed, grading into the pilosity, conspicuous on the thorax, petiole and gaster, somewhat shorter on the head, especially on its dorsal surface. Antennae and legs with fine, dense, subappressed pubescence.

Dark brown, almost black, mandibles and legs brownish yellow, or testaceous; clypeus, antennae and a large round spot on the front brownish red.

A single specimen which I found under a large stone embedded in the sand of the small beach of Tower Island.

I have described this form as new because I am unable to refer it to any of the species known to me from specimens or descriptions. The antennae seem to be most like those of *P. gleadowi* Forel of India and Borneo, but the color, sculpture, shape of petiole, etc., are very different.

Subfamily MYRMICINAE.

Pheidole williamsi Wheeler var. **seymourensis** var. nov.

Soldier and Worker. Differing from the typical *williamsi* of Indefatigable Island in color, the body being yellowish brown, with the posterior portion of the head, the dorsal surface of the thorax and nodes darker, the gaster almost castaneous brown, and the middle portions of the femora slightly infuscated.

Two very small colonies of this variety were found, one in a nest in the sand just beyond the beach on South Seymour Island, the other under a large stone in the bottom of the crater of Daphne Island. *Ph. williamsi* seems to be closely related to the tropicopolitan *Ph. megacephala* Fabr., but is smaller, the soldier has a smaller, more rounded head, with longer antennal scapes and there are differences in the structure of the thorax and pedicel, the humeri being less prominent and more rounded and the postpetiole shorter and more transversely elliptical.

Monomorium floricola Jerdon.

Several colonies of this minute tropicopolitan ant, hitherto unrecorded from the Galapagos Islands, were found nesting in dead twigs of *Bursera graveolens* Trian. and Planch. in the thickets on Tower Island. The workers were assiduously visiting the nectaries of the flowers of *Cordia lutea* Lam. and of the large cactus, *Opuntia helleri,* which is peculiar to the island. This ant must have reached Tower Island in floating vegetation since the females are wingless.

Solenopsis globularia F. Smith subsp. *pacifica* Wheeler.

(Fig. 22).

Female (dealated), undescribed. Length nearly 4 mm.

Resembling the worker. Head proportionally shorter and more rectangular; eyes much larger. Thorax from above elongate elliptical, narrower than the

head, about two and one-half times as long as broad; epinotum in profile rounded and steeply sloping, without distinct base and declivity; petiole higher and more compressed anteroposteriorly than in the worker; postpetiole short, transverse, about two and one-half times as broad as long. Gaster large and elongate. Sculpture, pilosity and color as in the worker, but each of the gastric segments with a broad, poorly defined, brown transverse band.

Numerous workers and a single female from several colonies found at Seymour Bay, Indefatigable Island, Daphne Island and Tower Island. On Daphne

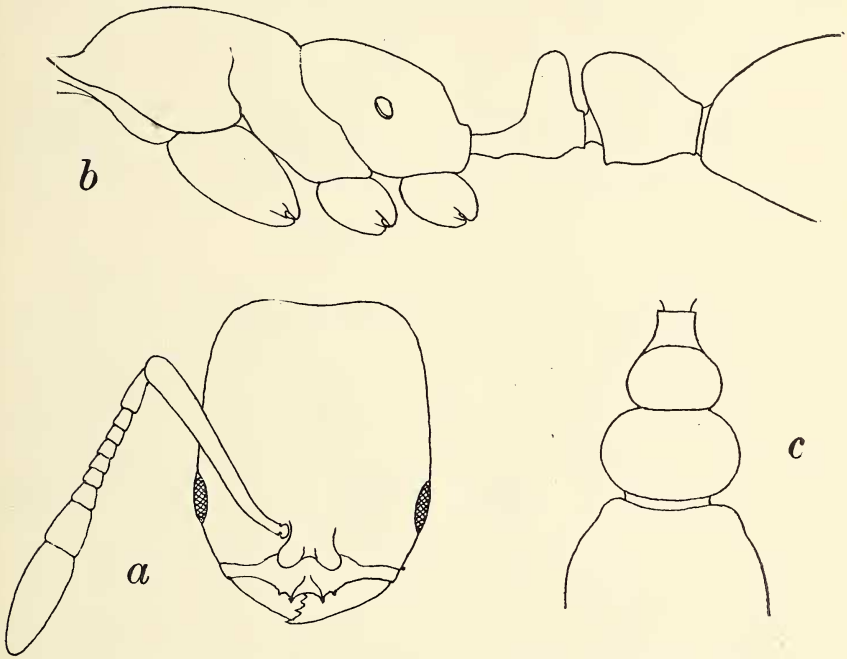

FIG. 22. *SOLENOPSIS GLOBULARIA* F. Smith subsp. *PACIFICA* Wheeler. *a*, head of worker; *b*, thorax and pedicel of same in profile; *c*, pedicel, dorsal view.

Island these ants were nesting under stones at the bottom of the crater, in the other localities under small logs lying on the sandy beach or among the thickets above high water mark. This subspecies was first taken on Albemarle and Tower Islands by F. X. Williams and the Albatross Expedition of 1899.

Tetramorium guineense Fabr.

In my previous paper I recorded this widely distributed tropicopolitan ant from South Albemarle (F. X. Williams). Emery mentioned it from Chatham Island (G. Baur) and the Albatross Expedition of 1899 secured it from the islands but failed to note the precise locality. I found it only on Tower Island, confined

to the small beach and nesting under stones and the bark of bushes. The workers were exploring the foliage of the bushes on which great numbers of frigate birds and gannets were nesting.

Subfamily DOLICHODERINAE.

Dorymyrmex (Conomyrma) pyramicus Roger subsp. *albemarlensis* Wheeler.

(Fig. 23).

This ant, previously known only from Albermarle Island, is common at Seymour Bay, Indefatigable Island and on South Seymour Island. It was

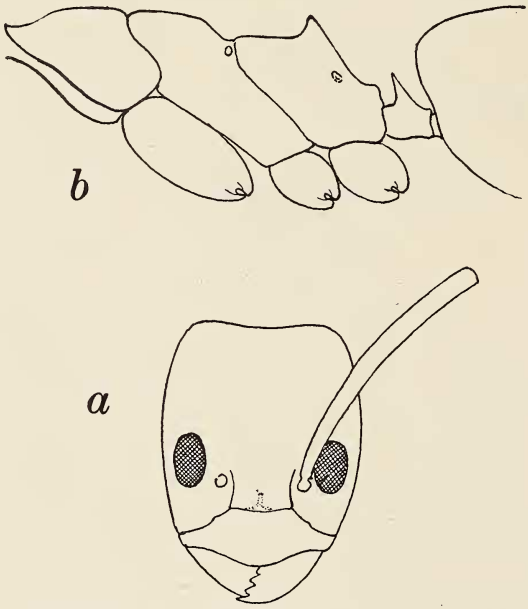

FIG. 23. *DORYMYRMEX (CONOMYRMA) PYRAMICUS* Roger subsp. *ALBEMARLENSIS* Wheeler.

a, head of worker; *b*, thorax and petiole of same in profile.

also taken by members of the expedition at Tagus Cove, Albermarle and on Eden Rock. It nests near sea-level in flat, crater nests in the sandy soil, or decomposed lava in the hot open spaces among the vegetation. The behavior of the very active and enterprising workers is like that of other forms of *pyramicus* which ranges from our Southern and Southwestern States to Argentina.

Tapinoma melanocephalum Fabr.

A widely distributed tropicopolitan ant, the "hormiga bottegaria" of the Latin Americans, previously taken on the east side of Indefatigable Island by Dr. F. X. Williams and on the boat at Chatham Island by Dr. G. Baur. I found several populous colonies on Tower Island, nesting in abandoned Calotermes galleries in dead branches of *Bursera graveolens*.

Subfamily FORMICINAE.

Prenolepis (Nylanderia) vividula Nyl. subsp. **guatemalensis** Forel var. **edenensis** var. nov.

Eight workers and a dealated female taken by members of the expedition from a single colony on Eden Rock agree closely with the var. *cocoënsis* Forel from Cocos Island, except in color, the gaster being dark brown, in the eyes of the worker which are smaller and more convex than in Forel's variety and the pubescence which, especially on the head and gaster, is distinctly longer, so that these regions are less shining.

Prenolepis (Nylanderia) fulva Mayr subsp. *nesiotis* Wheeler.

A number of workers taken from a single colony nesting in the sand above high water mark at Seymour Bay, Indefatigable Island agree closely with the cotypes of *nesiotis* from James Island in my collection, except in the coloration of the gaster, which is somewhat darker. The differences do not seem to be sufficient to justify the introduction of a new varietal name.

Genus *Camponotus* Mayr.

Perhaps no other group shows the poverty of the ant-fauna of the Galapagos so clearly as the genus Camponotus, which is represented by such an enormous number of forms in continental tropical America. Only three small species have been recorded from the archipelago: *senex, macilentus* and *planus,* all by Frederick Smith. He recorded the first as having been taken by W. E. Cookson, commander of the *Petrel* while on its voyage to the islands in 1875. As this species has since been taken only in Central and South America and as Smith was notoriously careless in making identifications even of species which he had himself described, I believe that we are justified in dropping it from the Galapagos faunal list. In British Guiana during the summer of 1920 and again in Panama during the summer of 1923 I had an opportunity to study *C. senex.* As Forel was the first to ascertain,[2] this ant, like Oecophylla and many species of Polyrhachis in the Old World and *C. formiciformis* Forel in Central America[3] makes a peculiar nest by using its larvae for spinning leaves together with layers of silk in the form of a ball. The nest may vary from the size of an orange to that of a football and is firmly attached to the twigs of a tree, sometimes at a considerable distance from the ground. Several nests may occur on a

[2] Biol. Centr. Amer. Formicidae, 1899–1900, p. 139, pl. 2, fig. 5.

[3] According to observations recorded in my paper "On the Presence and Absence of Cocoons among Ants, the Nest Spinning Habits of the Larvae, etc. Ann. Ent. Soc. Amer. 8, 1915, p. 323–342, fig. 1.

single tree and may, perhaps, belong to a single polycladic colony. So far as I have been able to observe, *senex* lives only in the low jungle and almost always on trees or bushes growing along watercourses. This is certainly not an environment to be encountered in the Galapagos Islands.

There remain therefore only two species of Camponotus, *macilentus* and *planus*, as occurring on the archipelago. They have been taken on nearly all the larger and on several of the smaller islands and are, in fact, the most abundant and therefore the dominant components of the ant-fauna in the low xerothermal zone, the only part of the islands which has been carefully investigated. Both are very timid species which rarely attempt to bite even when their nests are violently disturbed. Although they coexist in the same localities, their habits are so different that they do not encroach on each other's activities. The pale yellow *C. macilentus* is a nocturnal ant, which lives in rather small colonies in dead branches of trees and shrubs (*Bursera graveolens* and *Maytenus obovata*) that have been hollowed out by Calotermes and wood-boring beetles. The workers and soldiers were never seen abroad in the day-time. At the time of my visit to the islands in the latter part of April, the nests contained considerable brood and many males and winged females. These phases were also taken in August by Dr. F. X. Williams, so that there must be either two brief periods or, more probably, a single protracted period during which the sexual forms are produced. The black *C. planus*, on the other hand, is a strictly diurnal ant which forms much more populous communities and nests in the soil about the roots of trees, shrubs, the large arborescent Opuntias or in old logs. The entrances are small and concealed so that the nests are found only by accident or by following foraging workers. The latter are most frequently seen on the foliage of the thickets in search of insect prey or visiting the flowers for their nectar. The beautiful clustered yellow flowers of *Cordia lutea* attract them as well as many other insects, *Xylocopa*, *Chrysopa*, beetles, etc., in considerable numbers. On Indefatigable and South Seymour I failed to find any males or winged females in the nests during late April, but these phases were secured by members of the expedition April 1 to 7 on Chatham, Albemarle, James and at Conway Bay, Indefatigable Island. Dr. Williams collected males and winged females on Duncan, Charles and Indefatigable during August, October and November. It would seem, therefore, that

this species either sends off its sexual phases at very different times of the year on different islands or that they are developed continuously over a long period from August to the beginning of April.

I maintained in my former paper that both *macilentus* and *planus* have produced a number of varieties, one or more of which occur on each of the islands of the archipelago. The materials collected by the Harrison Williams expedition confirm this statement and fill some of the gaps in the previously known distribution of the species. No forms of *macilentus* were previously recorded from Indefatigable, but the expedition took a new dark variety and a paler undescribed form on that island and South Seymour. A hitherto unnamed variety was also secured on Tower Island. Previous expeditions took no forms of *planus* on James, but members of our party captured specimens of a new variety on that island and also the hitherto unknown male and female of the var. *peregrinus* Emery on Chatham. The two species of Camponotus are so variable and the differences between their varieties often so feeble and illusive that much more material will have to be studied before a satisfactory conspectus of their characteristics and distribution can be given. Future collectors in the islands should therefore make a strenuous effort to obtain as many specimens as possible of these ants.

In my former paper I placed *C. macilentus* in the subgenus Myrmamblys but Emery has recently removed it to his subgenus Pseudocolobopsis[4] and I have followed him in this paper. He agrees with me in placing *planus* in the subgenus Myrmorhachis Forel, but I have recently given the American species of this group the name Myrmocladoecus[5] and this name will have to be substituted for Myrmorhachis (Emery 1920). But all the known neotropical species of Myrmocladoecus (*bidens* Mayr, *bispinosus* Mayr, *latangulus* Rog., *mucronatus* Emery, *quadrilaterus* Mayr, etc.) nest in plant cavities, whereas *planus* nests in the ground. The structure of the head and thorax, the pilosity and sculpture would justify one in placing it in Orthonotomyrmex Ahsmead, were it not that this subgenus is now restricted to Old World species. The precise position of *planus* must therefore be left to be determined by the future student who can make a detailed study of the various sub-

[4] Le Genre "Camponotus" Mayr, Nouvel Essai de la Subdivision en Sousgenres. Rev. Zool. Afr. 8, 1920, p. 229–260.

[5] Professor Emery's Subgenera of the Genus Camponotus Mayr. Psyche 28, 1921, p. 19.

genera of Camponotus and of their limits. For the present I retain the species from the Galapagos in the subgenus Myrmocladoecus.

Camponotus (Pseudocolobopsis) macilentus F. Smith var. **sapphirinus** var. nov.

(Fig. 24).

Worker major. Length 6–7 mm.

Head about one-fifth longer than broad, distinctly broader behind than in front, with nearly straight sides and posterior border; anterior borders of cheeks not very convex nor projecting. Clypeus subrectangular, scarcely broader in front than behind, somewhat longer than broad, its posterior half distinctly

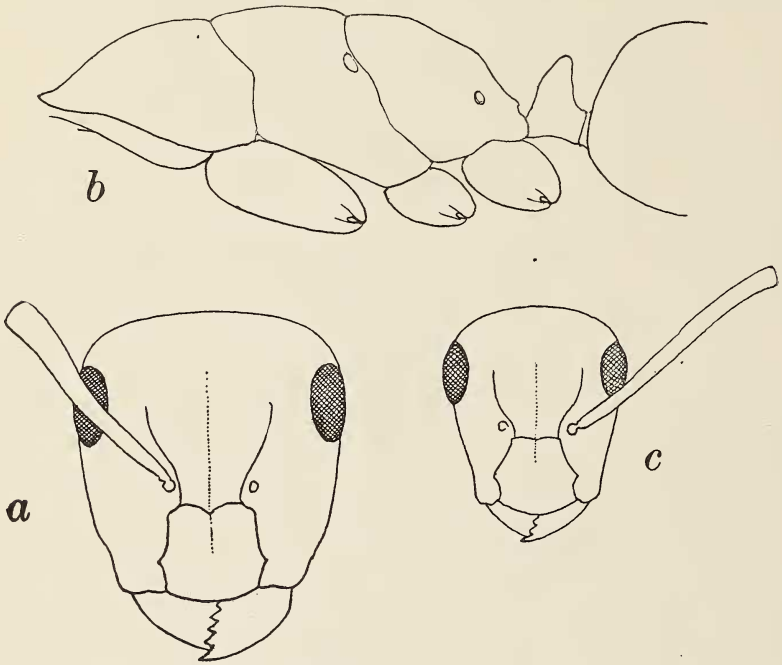

FIG. 24. *CAMPONOTUS (PSEUDOCOLOBOPSIS) MACILENTUS* F. Smith var. *SAPPHIRINUS* var. nov.

a, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor.

carinate in the middle, its anterior border very feebly and broadly rounded, rather receding. Scapes reaching nearly twice the width of their tips beyond the posterior corners of the head. Thorax strongly compressed behind, the epinotum in profile not evenly rounded but made up of three subequal planes meeting at rounded obtuse angles. Petiolar node low and thick, its upper border blunt, entire and when seen from behind broadly rounded.

Shining; mandibles and anterior portion of head less so than the remainder of the body, which is very finely shagreened.

Pilosity much as in the other varieties, the color considerably darker. Body

brownish yellow; mandibles and anterior border of head brownish red; antennae, a large spot on the front and vertex, the whole meso- and epinotum, the tibiae, tarsi and a broad transverse band on each gastric segment, brown; the cephalic spot, apical half of the scapes and gastric bands darker, more castaneous brown. Owing to its fine transverse shagreening the upper surface of the gaster in direct sunlight has a pronounced blue iridescence, which is absent or very faint in the other varieties. The top of the head and sides of the thorax display a similar but feebler iridescence.

Worker minor. Length 4.5–5.5 mm.

Closely resembling the major worker, except in the shape of the head, which in the minima is nearly one and one-third times as long as broad, with more rounded posterior corners. straight, anteriorly somewhat converging cheeks and broader and less distinctly carinate clypeus, The scapes extend about one-third their length beyond the posterior corners of the head. Color similar to that of the worker major, but there are differences in the head, which is whitish or ivory yellow in front and diffusely brownish behind; the mandibles are brownish yellow, the antennae, especially the apical halves of their scapes, paler than in the major. The pronotum may be somewhat brownish posteriorly, but this is also the case in some of the larger workers.

Female (deälated). Length 7–8 mm.

Like the major worker, but with larger eyes, shorter clypeus and the anterior portion of the head more sharply sculptured. Petiolar node very thick and broad, its superior border entire, very blunt, straight and transverse. The pilosity and color are also similar but in some specimens the dark brown area on the front and vertex is more extensive and less sharply defined, in others restricted to the ocellar triangle. Each ocellus has a black spot at its inner border. Mesonotum with a large rectangular brown spot on the middle of its posterior three-fourths in some specimens, in others there is merely a brownish cloud.

Male. Length 5–5.5 mm.

Pale ivory yellow, head and gaster brownish, the latter with the posterior borders of the segments yellow; the former with the ocellar triangle dark brown, almost blackish, and each ocellus with a black spot at its inner border; the front pale brown but somewhat variable in different specimens. Wings pale yellowish hyaline, the pterostigma scarcely darker than the veins, which are pale yellow. There is a small black spot at the base of each of the anterior wings.

Described from numerous specimens nesting in hollow twigs of *Maytenus obovata*, previously inhabited by *Calotermes pacificus* colonies, near sea-level at Seymour Bay, Indefatigable Island and on South Seymour Island.

This variety of *macilentus* differs markedly from all those previously described in the deeper and more extensive infuscation of the head, thorax and gaster and the distinct iridescence of the gaster in the worker and female.

Camponotus (Pseudocolobopsis) macilentus var. **pervicus** var. nov.

Worker major. Length 4.5–5 mm.

Very similar to the preceding variety but smaller, more thickset, with proportionally larger head and paler, posteriorly less compressed thorax. Thorax and petiole immaculate, the head with a pale brown, sometimes very faint, spot on the vertex. Bands on the gaster much narrower, each produced anter-

iorly as a point in the middle line. Apical half of scapes in some specimens with a black streak on its anterior and posterior border. The ground color of the body, especially of the thorax, petiole and gaster is paler than in the var. *sapphirinus* and there is scarcely a trace of iridescence.

Worker minor. Length 4 mm.

Very similar to the major worker in color; the head as in the var. *sapphirinus* but the body smaller.

Female. Length 6–6.5 mm.

Smaller than *sapphirinus* and colored like the major worker, but with a faint brownish cloud on the vertex and posterior portion of the mesonotum. Each ocellus has the usual black spot at its inner border. Wings 6.5 mm. long, distinctly brownish yellow, with brownish yellow veins and pterostigma.

Male. Length 4.5 mm.

Also smaller than the corresponding sex of *sapphirinus*, but the gaster is as pale as the head and thorax and the suture between the mesonotum and scutellum is black. The vertex is brownish, the ocelli as usual with a black spot at their inner borders.

Several specimens from a single small colony taken in a *Maytenus obovata* twig at Seymour Bay, Indefatigable Island.

The small dimensions of all four phases show that we are dealing with a distinct variety or subspecies of *macilentus*.

Camponotus (*Pseudocolobopsis*) *macilentus* var. *jacobensis* Wheeler.

Single winged female and male specimens taken by members of the expedition on James Island April 5th, though somewhat darker, agree well with my topotypes collected by Dr. F. X. Williams.

Camponotus (**Pseudocolobopsis**) **macilentus** var. **castellanus** var. nov.

(Fig. 25).

Worker major. Length 6–7 mm.

Head fully one and one-fourth times as long as broad, subrectangular, scarcely narrowed in front except at the extreme anterior end of the cheeks, the posterior border and sides straight. Cheeks in front convex and projecting on either side of the clypeus, which is subelliptical and notched behind at the indistinct frontal area. Scapes extending beyond the posterior corners of the head a distance equal to the width of their tips. Posterior portion of thorax moderately compressed, the base of the epinotum in profile convex and rounded, decidedly longer than the abrupt, concave declivity. Petiolar node smaller and thinner than in the other varieties, its superior border rather sharp, transverse and feebly concave in the middle.

Sculpture of the mandibles, anterior and dorsal surface of the head rather sharp so that these regions are distinctly less shining than the remainder of the body.

Brownish yellow; coxae and femora paler, thorax and petiole immaculate; mandibles, anterior border of clypeus and cheeks, apical half of scapes, a large spot on the front and vertex, tibiae and tarsi reddish brown. Gaster dark brown, with the posterior border and two transverse spots at the base of each segment, brownish yellow.

Worker minor. Length 4–5.5 mm.

Head very similar to that of the major worker, but with sides feebly rounded, scarcely narrower in front than behind, clypeus shorter, distinctly carinate. Antennal scapes extending about one-third their length beyond the posterior border of the head. Color similar to that of the major but mesonotum, epinotum and petiole brownish. Tibiae only slightly darker than the femora, which

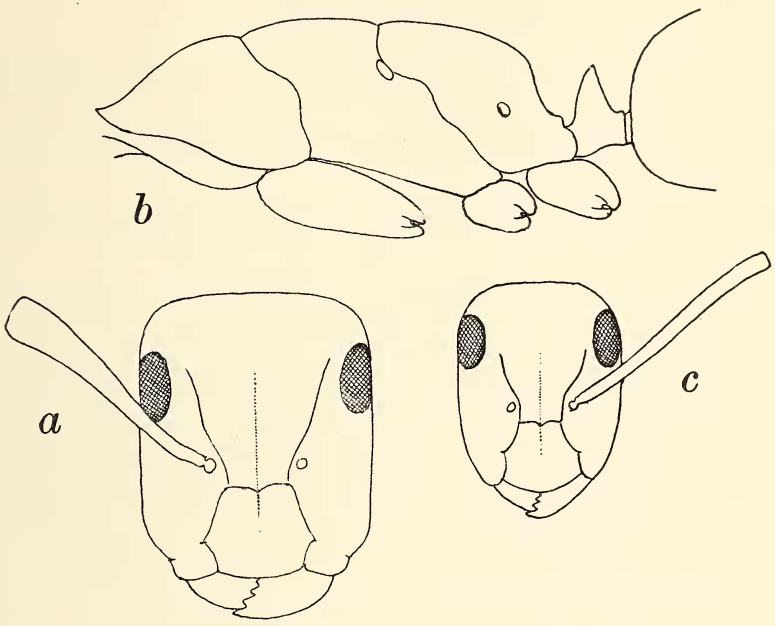

FIG. 25. *CAMPONOTUS (PSEUDOCOLOBOPSIS) MACILENTUS* F. Smith var. *CASTELLANUS* var. nov.

a, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor.

like the coxae, anterior portion of the head and paler portions of the gaster, are whitish or ivory-yellow; knees brownish. The epinotum and petiolar node have the same shape as in the major worker.

Female. Length 7–7.5 mm.

Head large, like that of the major worker, not narrowed in front, but the scapes extend about twice their greatest diameter beyond the posterior corners. Color as in the worker major but the scutellum and a large rectangular spot on the posterior portion of the mesonotum are brown. Wings nearly 8 mm. long, distinctly brownish yellow, with pale brownish pterostigma and pale yellow veins.

Male. Length 5.5–6 mm.

Brownish yellow, the gaster a shade darker, the mandibles, anterior portion of head, pleurae, coxae and femora paler; a small black spot at the base of each fore wing and the usual black spot at the inner border of each ocellus

very distinct. Ocellar triangle more or less brownish. Wings paler than in the female, the pterostigma not darker than the veins, which are pale yellow.

Described from numerous specimens taken from dead twigs and branches of *Bursera graveolens*, abandoned by colonies of *Calotermes pacificus*, on Tower Island. In my paper of 1919 (p. 287) I recorded a major and two minor workers of this variety, among the material taken in 1899 by the "Albatross" on the same island, but the specimens were so greasy and defective that I did not give them a name.

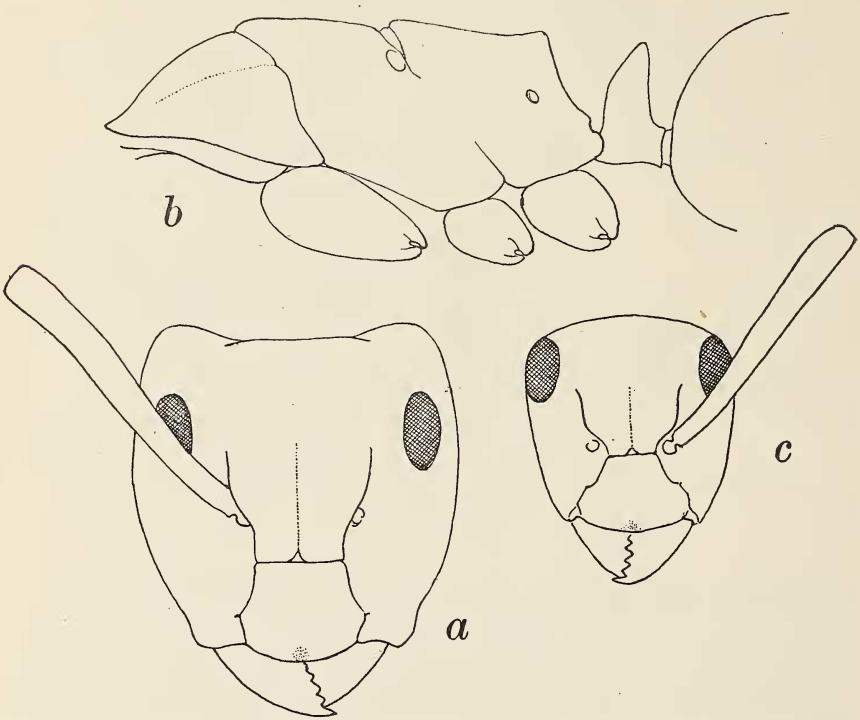

FIG. 26. *CAMPONOTUS* (*MYRMOCLADOECUS*) *PLANUS* F. Smith var. *SANTA-CRUZANUS* Wheeler.

a, head of worker major; *b*, thorax and petiole of same in profile; *c*, head of worker minor.

This variety is distinct in the shape of the head in the worker and female and in that of the petiolar node of the worker. In these phases there is a faint trace of iridescence on the gaster when it is viewed in direct sunlight. The same is also true of the var. *jacobensis*.

Camponotus (*Myrmocladoecus*) *planus* F. Smith var. *peregrinus* Emery.

Female (undescribed). Length 7.5 mm.

Compared with the typical *planus* of Charles Island, the differences are mainly in color and pubescence. The body is black, the red areas of *planus*

being more restricted and the red shade of the appendages deeper. On the gaster the appressed pubescence is distinctly shorter, less dense and less silky, so that this region has a different, faintly grayish luster. The pterostigma of the wings is pale yellow, like the veins.

Male (undescribed). Length 5.5 mm.

Also darker than the male of the typical *planus*, the body being jet black; the mandibles, funiculi and trochanters reddish, and the legs and antennal scapes black, slightly tinged with red. Pterostigma and veins of wings pale brown.

Single specimens taken by members of the expedition on Chatham Island, April 7th, 1923.

Camponotus (*Myrmocladoecus*) *planus* var. *isabelensis* Wheeler.

I refer two males taken April 6th, at Tagus Cove, Albemarle Island to this variety.

Camponotus (*Myrmocladoecus*) *planus* F. Smith? var. *santacruzensis* Wheeler.

(Fig. 26).

Specimens from several large colonies were collected at Seymour Bay, Indefatigable Island and on South Seymour Island during the latter part of April. They were nesting in the ground about the roots of trees and shrubs and the large arborescent Opuntias peculiar to the islands. The largest workers attain a length of 7 mm. which is a millimeter more than I recorded for the specimens collected by Dr. Williams. The body has little pilosity and the head is entirely black, not red anteriorly as in the following variety:

Camponotus (*Myrmocladoecus*) *planus* var. *indefessus* Wheeler.

A number of small workers and males were taken by members of the expedition April 1st, 1923 at Conway Bay, Indefatigable Island.

Camponotus (**Myrmocladoecus**) **planus** F. Smith? var. **sansalvadorensis** var. nov.

(Fig. 27).

Worker minor. Length 4.5–5.5 mm.

Head trapezoidal, slightly longer than broad, with straight anteriorly converging sides, the eyes at the posterior corners and apparently somewhat more projecting and convex than in the other varieties. Antennal scapes slender and terete at the base, even in the media (in other forms of the species broader and at least slightly flattened), extending somewhat less than half their length beyond the posterior border of the head. Thorax with the base of the epinotum distinctly concave in profile, its posterior angles somewhat dentate, much as in the var. *indefessus*. Pilosity as abundant as in that form but slightly shorter and paler. The appressed pubescence on the gaster is distinctly paler and sparser so that it has only a faint, silvery luster. Body subopaque and of the usual sculpture and color, only the mandibles, anterior edges of the cheeks and the appendages being red.

Male. Length 4–5.3 mm.

Indistinguishable from the male of the var. *peregrinus* Emery.

Six workers and five males, taken April 5th, 1923, on James Island by some of the members of the expedition.

The distinguishing character of this variety seems to be the terete, or cylindrical base of the antennal scapes, which are broader and distinctly more or less flattened in the other forms of the species. Probably the unknown worker major has flattened but very narrow scapes.

The known distribution of the various forms of *C. macilentus* and *planus* is given in the following table, which is merely an amplification of the one published in my paper of 1919. It will be seen that while some form of *macilentus* is known to occur on each of the islands on the list except Chatham, *planus* is unknown from Hood, Bindloe and Tower. I feel confident that it really does not exist on the outlying Tower and that the same statement is probably true of Bindloe, but Hood, judging from its geographical position, should yield a distinct variety. The occurrence of a peculiar variety of *macilentus* may also be predicted for Chatham.

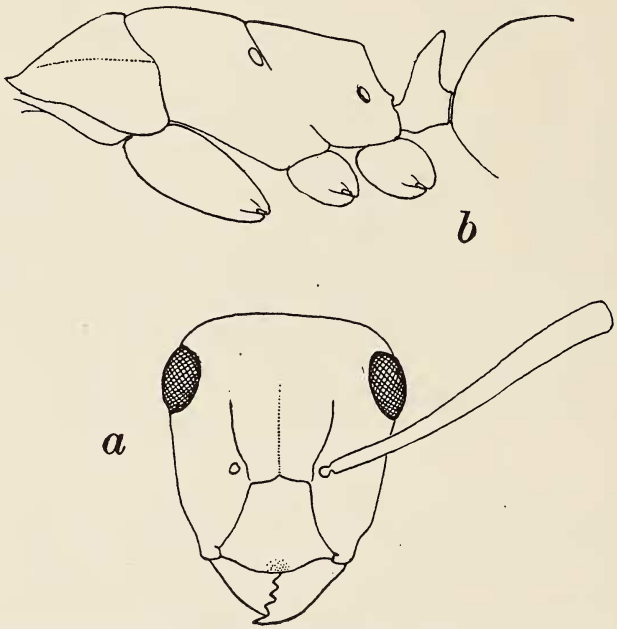

FIG. 27. *CAMPONOTUS (MYRMOCLADOECUS) PLANUS* F. Smith var. *SANSALVADORENSIS* var. nov.

a, head of worker media; *b*, thorax and petiole of same in profile.

	ISLANDS	
Macilentus, typical	Charles	*planus*, typical
(? an undescribed variety)	Chatham	var. *peregrinus*
var. *narboroënsis*	Narborough	var. *fernandinensis*
var. *albemarlensis*, var. *vulcanalis*	Albemarle	var. *isabelensis*
var. *duncanensis*	Duncan	var. *pinzonensis*
var. *pervicus*, var. *sapphirinus*	Indefatigable	var. *indefessus*
	South Seymour	var. *santacruzensis*

var. *hoodensis*	Hood	(? an undescribed variety)
var. *barringtonensis*	Barrington	var. *fidelis*
var. *jacobensis*	James	var. *sansalvadorensis*
var. *bindloënsis*	Bindloe	(? absent)
var. *castellanus*	Tower	(absent)

In conclusion I append a complete list of the Galapagos Formicidae with their distribution, so far as it has been ascertained from the materials collected by the Harrison Williams and previous expeditions. For reasons given above I have omitted *Camponotus senex* and have substituted *Cylindromyrmex williamsi* for *C. striatus*. As revised the list shows that forty-two different forms have so far been taken in the islands, that there are only five species, but twenty-eight varieties or subspecies, peculiar to their fauna and that some nine species are common tropicopolitan vagrants, or tramps. The list also shows that nearly twice as many ants (12) are recorded from Indefatigable as from any of the other islands. This merely means, of course, that more numerous collections have been made in that one locality.

This is one of the series of scientific papers of the Harrison Williams Galapagos Expedition, under the directorship of William Beebe, sent out by the Department of Tropical Research of the New York Zoological Society. The general account and narrative of the expedition, together with the natural history and photographs of the fauna, are embodied in a volume by William Beebe, published by G. P. Putnam's Sons, under the auspices of the Zoological Society. Its title is "Galapagos; World's End."

Names of Species, Subspecies and Varieties	Narborough	Albemarle	Duncan	Charles	Hood	Chatham	Barrington	Indefatigable	Eden Rock	South Seymour	Daphne	James	Tower	Bindloe	Abingdon
Cylindromyrmex williamsi	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—
Ponera beebei	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—
Odontomachus haematoda subsp bauri.	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—
Pheidole williamsi	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
var. seymourensis	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—
Pheidole sp.	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
Solenopsis saevissima	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Solenopsis geminata	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Solenopsis globularia var. galapagaea	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
var. pacifica	—	×	—	—	—	—	—	×	—	—	×	—	×	—	—
var. rubida	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
Monomorium pharaonis	—	—	—	—	—	—	—	×	—	—	—	—	—	—	×
Monomorium floricola	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—
Tetramorium guineënse	—	×	—	—	—	×	—	—	—	—	—	—	×	—	—
Tetramorium simillimum	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Dorymyrmex pyramicus subsp. albemarlensis	—	×	—	—	—	—	—	×	×	×	—	—	—	—	—
Tapinoma melanocephalum	—	—	—	—	×	×	—	×	—	—	—	—	×	—	—
Prenolepis longicornis	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Prenolepis vividula var itinerans	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—
var. edenensis	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
Prenolepis fulva subsp. nesiotis	—	—	—	—	—	—	—	×	—	—	—	×	—	—	—
Camponotus macilentus	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
var. jacobensis	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—
var. albemarlensis	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
var. vulcanalis	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
var. duncanensis	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
var. narboroënsis	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
var. hoodensis	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
var. barringtonensis	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
var. bindloënsis	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—
var. sapphirinus	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—
var. pervicus	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
var. castellanus	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—
Camponotus planus	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
var. peregrinus	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
var. isabelensis	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
var. indefessus	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
var. santacruzensis	—	—	—	—	—	—	—	×	—	×	—	—	—	—	—
var. fidelis	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
var. fernandinensis	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
var. pinzonensis	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
var. sansalvadorensis	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—
Number of forms on each island	2	7	2	6	3	6	2	13	2	5	2	3	6	1	1